Children with PIMD in interaction with peers with PIMD or siblings

Sara Nijs, Carla Vlaskamp & Bea Maes

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Abstract

Background The complex disabilities of children with profound intellectual and multiple disabilities (PIMD) impede their presentation of peer directed behaviours. Interactions with typically developing peers have been observed to be more frequent than those with peers with PIMD. The typically developing peers with whom people with PIMD have frequent contact are their siblings. In this study the amount of peer directed behaviours was compared between an interaction with a sibling and an interaction with a peer with PIMD. In addition, the attention directing strategies of the siblings, and how these affect the presentation of peer directed behaviours, were examined.

Method Thirteen children and young people with PIMD, who had a typically developing sibling, were identified. For each of these thirteen children, a peer with PIMD and a sibling were selected. The child with PIMD was observed together with a peer with PIMD and together with a sibling. In both conditions video observations were conducted. A coding scheme for the peer directed behaviours of the children and young people with PIMD and a coding scheme for the attention directing behaviours of the siblings were used. Descriptive, comparative and sequential analyses were conducted.

Results Significantly more peer directed behaviours of the children with PIMD were observed in the condition with the sibling (30,76%) compared to the condition with the peer with PIMD (13,73%). The siblings presented attention directing behaviours in 30% of the time; the most frequently used was nonverbal behaviour. When the siblings presented a combination of verbal and nonverbal attention directing behaviours they elicited multiple peer directed behaviours in the children and young people with PIMD.

Conclusions Persons with PIMD interact more with their siblings compared to their peers with PIMD. Interacting with siblings may probably be more motivating and encouraging. Presenting

a combination of verbal and nonverbal behaviours attracts more attention of the persons with PIMD.

1. Introduction

Peer interactions and relationships can be supportive of various developmental and quality of life outcomes such as subjective wellbeing (e.g. Karelina & De Vries 2011; Rook 1984), cognitive and language development (e.g. Canevello & Crocker 2010; Hartup 1989), mental and physical health (e.g. Cacioppo *et al*. 2000; Cohen 2004; Karelina & De Vries 2011; Lincoln 2000; Umberson & Montez 2010), and stress coping (e.g. Hartup & Stevens 1997).

The constitutive components of peer relationships and peer interactions are peer directed behaviours. In developmental psychology literature, peer directed behaviours imply a coordinated look at the peer in combination with a social action such as touching the peer or talking to the peer (Mueller & Brenner 1977; Williams *et al.* 2010). With regard to persons with PIMD these behaviours are referred to as *multiple* peer directed behaviours. This definition of peer directed behaviours however does not capture all the behaviours that persons with profound intellectual and multiple disabilities (PIMD) may direct towards their peers (Nijs *et al.* in press). Persons with PIMD have profound intellectual disabilities which present challenges to their understanding of verbal and symbolic language, and their communicative expressions (Nakken & Vlaskamp 2007; Petry & Maes 2007). They communicate on a pre- or protosymbolic level. They present idiosyncratic expressions such as body movements, muscle tension, vocalisations, and other subtle signals which are context bound and personal (Grove *et al.* 1999; Hostyn & Maes 2009; Olsson 2004; Porter *et al.* 2001). Behaviours which attract the attention of others such as waving or touching are impeded by their physical disabilities (Houwen *et al.* 2014; McEwen 1992; van der Putten *et al.* 2005). Their visual or hearing impairments, and the slowness of their reactions make it difficult to initiate a reciprocal interaction (Brown *et al.* 2001; Girolametto *et al.* 2004; Guralnick 1999; Vlaskamp, 2011). Including the *singular* peer directed behaviours in which a single socially directed behaviour is observed, seems necessary to grasp the abilities of persons with PIMD in presenting peer directed behaviours (Nijs *et al.* in press; Nijs *et al.* 2014).

Persons with PIMD have social contacts with varied types of peers: typically developing peers, peers with a mild, moderate or severe intellectual disability or other persons with PIMD (Nijs & Maes 2014). Peer interactions are marked by an equality, an equality in age or developmental level (Hartup & Moore 1990; Mueller & Silverman 1989; Nijs & Maes 2014; Selby & Bradley 2003). A review of research literature (Nijs & Maes 2014) found that interaction research involving children and young people with PIMD focused mainly on interactions with typically developing peers. Interactions with typically developing peers seem to have a positive influence on the motor responses and behaviours (Anderson & Brady 1993; Brady *et al.* 1991) and on behaviours indicative of pleasure in persons with PIMD (Logan *et al.* 1998). The frequency of observed peer interactions and peer directed behaviours of persons with PIMD is higher during interactions with typically developing peers compared to interactions between persons with PIMD (Foreman *et al.* 2004; Hanline; 1993; Nijs & Maes 2014). During group activities a higher percentage of peer interactions was observed during group activities with typically developing peers compared to group activities with peers with moderate to profound intellectual disabilities (Logan *et al.* 1998) and only a limited number of peer directed behaviours of persons with PIMD directed towards peers with PIMD were observed (Nijs *et al.* in press). Hanline (1993) observed three children with PIMD during outdoor supervised play and although they got the chance to interact with other children with PIMD, they only interacted with typically developing peers. Foreman *et al.* (2004) observed more awake-active-alert behaviours and communicative peer interactions in persons with PIMD in general classrooms compared to special classrooms.

Although peer interactions of persons with PIMD are more commonly studied with typically developing peers, in most countries persons with PIMD do not often participate in inclusive settings where they can meet typically developing peers (Kamstra *et al.*, 2014). If children with PIMD have the chance to get in contact with typically developing peers, it is often with their

siblings. For most children, siblings are important interaction partners in their social environment, since siblings are the peers whom children mostly may have contact with (Anderson et al. 1994; McHale, 2012; Vandell & Wilson 1987). Sibling relationships can be very supportive throughout life and form a rich social context in which children can learn and practice a range of social skills. Affectionate caring, conflict resolution, and control of hostile and envious feelings are developed in sibling interactions (Berk 2003). Sibling relationships in which a child with a disability is involved seem to be warm and positive, however, the more severe the disability of a child, the more difficult it is to engage in interactions with brothers or sisters (Stoneman 2001). During interactions between a child with PIMD and a typically developing sibling an inequality in development arises which may increase their capabilities in interacting (Berk 2003; Brownell 1990; Hartup & Moore 1990; Mueller & Silverman 1989; Vygotsky 1978; Wood *et al.* 1976).

Various studies investigated the interactions between children with disabilities and typically developing siblings. For example Caro and Derevensky (1997) observed pre-school and school-aged sibling interactions in the home environment by using the Sibling Interaction Scale which consists of 12 items such as body position, language and feedback. They concluded that the presentation of behaviours during the interactions is age-related and that role differences between siblings with and without disabilities were observed. Nondisabled siblings took more the role of the manager or teacher instead of an equal role. Lobato *et al.* (1991) observed sibling dyads of typically developing children and dyads of a typically developing child and a child with disabilities. More parallel and social play and more nurturing behaviours were observed in the siblings of children with disabilities. Dallas *et al.* (1993a; 1993b) observed sibling dyads of children with cerebral palsy in semi-structured play sessions and coded the behaviours of the children in terms of directedness, aggression, cooperation, and mobility. The children with a disability did not often initiate and direct the interactions, they were passive and lacked

assertiveness. The observed relations were hierarchical; the typically developing sibling was more directive and led the interactions.

Based on the previous research we hypothesise that children and young people with PIMD will present an increased amount of peer directed behaviours in interactions with typically developing siblings. Consequently, these interactions may deliver us a better understanding of the peer directed behaviours of children and young people with PIMD and of the way in which these behaviours may be elicited by an interaction partner. Our first aim is to compare the peer directed behaviours of children and young people with PIMD in a condition with a peer with PIMD and in a condition with a sibling. We want to characterize the frequency and the nature of peer directed behaviours of children and young people with PIMD in interactions with peers with PIMD as well as with siblings. Based on the results of previous studies we expect to observe an increased amount of peer directed behaviours and increased variability during the condition with the sibling (Foreman et al. 2004; Hanline 1993; Nijs & Maes 2014). Additionally, we predict to observe more multiple peer directed behaviours during interactions with the sibling because the sibling can promote and support these more complex behaviours. This may deliver more insight in how children and young people with PIMD present their interest in peers.

The study's second aim is to investigate the behaviour of the siblings in more detail. How do siblings direct the attention of the children and young people with PIMD? Earlier research focussing on interactions between direct support workers and children and young people with PIMD has demonstrated that the direct support workers mostly use objects in a visual way or verbally attempt to direct the attention of the person with PIMD. Direct support workers seldom use tactile attention directing behaviours (Hostyn *et al.* 2011; Neerinckx *et al.* 2014). We expect that siblings use a greater variety of attention directing behaviours, including tactile strategies.

The third aim of this study is to investigate which attention directing behaviours of the siblings are most effective in eliciting peer directed behaviours in the children and young people with PIMD. Direct support workers and teachers often distract peers from interacting with each other (Hunt *et al.* 1996; Logan *et al.* 1998). They either do not recognise the peer directed behaviours in children and young people with PIMD, or do not succeed in promoting peer directed behaviours in children and young people with PIMD (Nijs *et al.* 2014). We suppose that the attention directing behaviour of the siblings will give us more insight into how peer directed behaviours in children and young people with PIMD could be recognized and supported. This can help direct support workers to create more opportunities and to support and promote the peer directed behaviours among children and young people with PIMD.

2. Methods

2.1. Participants

Schools and facilities for children and young people with PIMD in Flanders and the Netherlands were contacted by e-mail and phone and asked for their participation in this study. Seven facilities in Flanders and one facility in the Netherlands; five day care and three residential educational centres, were willing to participate. The direct support workers were asked to select participants with PIMD based on the key characteristics described by Nakken and Vlaskamp (2007). To select the participants we stated the following inclusion criteria: (1) having a profound intellectual disability, (2) having profound motor disabilities, (3) aged between 6 and 18 years, (4) peer familiarity of at least 12 months (5) having no diagnosis of autism, (6) having a typically developing sibling aged between 6 and 12 years. Persons with a diagnosis of autism were excluded because of their specific difficulties regarding social interactions. For every participant with PIMD a typically developing sibling aged between six and 12 years and a peer with PIMD who met the same inclusion criteria except for point six were selected. The

representatives of all participating children and young people with PIMD and siblings were informed about the nature of the study, the anonymity, and the confidentiality of the obtained data. If they were willing to participate they were asked for their written consent. Sibling or parents could decide at any time to stop their participation or the observation. The observation study was performed in coherence with the standards of the university ethical committee who reviewed and approved this study. The parents of the participating siblings were asked to fill in a client information form about the background of the child. In these forms, we asked about the age of the child, how often the siblings meet each other, the sibling relationship and developmental or psychological impairments.

The group of children and young people with PIMD consisted of 13 children and young people with PIMD, five boys and eight girls aged between six years 11 months and 17 years eight months. The mean age of the children with PIMD was 11 years and eight months. Based on their personal files all participants were considered as children and young people with PIMD. Based on the personal records for seven participants an estimation of the developmental level was assessed by use of the Bayley Scales for Infant Development or the Kent Infant Development Scale. It ranged between two and 24 months. For the other persons with PIMD no information with regard to their developmental level was available. Four of the participants had a visual impairment, two an auditory impairment and all children and young people with PIMD had severe motor disabilities and were not independently mobile.

For every child with PIMD a peer with PIMD who had lived for at least 12 months in the same group as the child with PIMD was selected. They met each other on a daily basis. The group of peers with PIMD consisted of eight boys and five girls, aged between six years six months and 18 years one month. The mean age was 11 years and nine months. Based on the personal files all peers can be considered as children and young people with PIMD. For five of the peers with PIMD an estimation of the developmental level was assessed by use of the Bayley Scales for

Infant Development or the Kent Infant Development Scale level and this ranged between two and 12 months. Four of the peers with PIMD had a visual impairment and one of them was blind. One of the children had an auditory impairment and none were independently mobile.

For the 13 children and young people with PIMD a sibling was selected, eight brothers and five sisters. The mean age of the siblings was ten years and eight months. Most siblings meet each other at home, four of them also meet at the facility. Parents characterized the relation between the siblings on a scale which they could choose between: no relation (n = 0), negative (n = 0), variable (n = 0), good (n= 6) and close (n = 7). All parents indicated that the siblings communicate in a nonverbal way with the person with PIMD, 11 siblings often interact verbally and four use idiosyncratic gestures used within the family.

In table 1 an overview of the client information per triad is presented.

2.2. Procedure

Each of the target children with PIMD was observed in a condition together with a peer with PIMD and in a condition together with their sibling. In both conditions video observations were done by use of two video cameras to record both children's faces and to make reliable observations. One video camera recorded from one corner of the room, the other camera recorded from the opposite corner of the room. The direct support worker, parent and/or researcher followed outside the room on a video screen to avoid attracting the attention of the children. In both conditions the two children were observed for 20 minutes. After ten minutes of observation the support worker or parent entered the room for a short break before continuing with another ten minutes of observation. The children and young people with PIMD were told that they were going to be left in the room for a while together with their peer or sibling. The siblings were asked to play with the child with PIMD. When observing the two children and young people with PIMD they were facing and in proximity with each other, so they could see

and touch each other. All observations took place at home or in the facility in a room familiar to the participants.

2.3. Data gathering and coding

Before starting the observations the familiar direct support workers were asked to fill in a client information form for the participants with PIMD. The first part of the form contains questions about the general background and disabilities of the participating children (e.g. age, gender, cognitive level, disabilities). In the second part three factors out of the Checklist of Child Characteristics (Tadema & Vlaskamp 2004; Tadema *et al.*, 2005, 2007) were used to get a communication profile of every person with PIMD. These profiles helped during the coding process because they deliver additional information on how the child communicates and shows attention. The three factors used in the profile are (1) Functions that are necessary for focusing on surroundings and for being able to play an active part; (2) Being able to carry out basic communication activities; (3) Participation by the child when there is one-to-one contact. For every factor a quartile score can be calculated and reflects the ability level as weak, moderate, reasonably strong, or strong in a reference group of children and young people with PIMD (Tadema *et al.*, 2005).

To code the behaviours of the children and young people with PIMD and the siblings the software program The Observer XT 10.5 was used. The video recordings were coded continuously; for every second a code was allocated to the behaviour. Two coding schemes were used, one for the peer directed behaviours of the children and young people with PIMD and one for the attention directing behaviours of the siblings.

The coding scheme (see table 2) for the behaviours of the children and young people with PIMD has already been used in a previous study (Nijs *et al.* 2014). The coding scheme consists of

three main mutually exclusive categories. The first category ‘other behaviour’ is coded when the child with PIMD is not directed towards the peer. If the child with PIMD presents peer directed behaviour a distinction is made between multiple and singular peer directed behaviour. The category ‘multiple peer directed behaviour’ is used when the child looks at or turns his head or body in the direction of the peer in combination with another behaviour, such as waving, vocalising or touching. The category ‘singular peer directed behaviour’ is coded when the child with PIMD looks at the peer without presenting other behaviour or for example touches the peer without looking at him. This category is included to not only focus on behaviours in which a clear (visual or physical) directedness or orientation on the peer can be observed. Due to the profound disabilities of persons with PIMD we may assume that this directedness or orientation is often difficult to present, in particular in combination with another behaviour. For both the multiple and singular peer directed behaviours various modalities can be observed.

The coding scheme for the attention directing behaviours of the sibling was based on coding schemes developed by Hostyn et al. (2010) and Neerinckx et al. (2014). We used the same modalities of behaviours but made a different distinction in these behaviours. The coding scheme consists of two main categories (table 3). The first category ‘other behaviour’ is used when the sibling does not try to attract the attention of the child with PIMD. The second category is used to code the attention directing behaviours. The first part in this category consists of mutually exclusive codes reflecting the nonverbal attention directing behaviours such as attracting the attention by touching the child with PIMD or supporting the child physically. A combination code is added to the coding schema which can be used when the child presents two sorts of nonverbal attention directing behaviours. The second part consists of mutually exclusive codes reflecting the verbal attention directing behaviours such as singing or talking about an object. The verbal and nonverbal attention directing behaviours can be presented simultaneously, therefore these parts are not mutually exclusive.

Interobserver agreement was determined to assess the reliability of the coding schemes. The exact agreement was calculated for the total coding schemes. Agreements in coding between the primary investigator and an independent rater were marked when they allocated the same code to the same second. By dividing the number of agreements by the total number of observed seconds and multiplying by 100 the percentage of exact agreement was determined. A satisfactory exact agreement is reached when the agreement lies between 70% to 80% (Kazdin, 1977). Because of the high number of codes and non-use of various codes Cohen's Kappa coefficient was calculated for the main categories in the coding scheme. Because of the differences in reaction time between observers we set a tolerance window in calculating the Cohen's Kappa Coefficient (Bakeman & Quera, 2011).

The reliability data on the coding scheme for the behaviours of the children and young people with PIMD have already been reported in another study (Nijs *et al.* 2014). This interobserver agreement reached a sufficient level (Nijs *et al.* 2014). A substantial Cohen's Kappa coefficient, using a time window of three seconds, of .72 was obtained for the three main categories in the scheme (Landis & Koch 1977). The exact agreement for the coding scheme of the behaviour of the child with PIMD with all 21 codes was 72%, which is considered as satisfactory (Kazdin 1977).

The coding for the siblings' behaviour was carried out by one researcher and two master students. A training programme for the master students was set up by the first author to inform them about the coding scheme and the attention directing behaviour. 26.47% of the total observation time was double coded. Cohen's Kappa coefficient was calculated using a two second time interval. A substantial Kappa coefficient of .68 was obtained for the nonverbal behaviour. An almost perfect Kappa coefficient of .85 was obtained for the verbal behaviour (Landis & Koch 1977).

2.4. Analysis

Sometimes observations were interrupted by for example the sound of the nutrition probe or the typically developing siblings who came to their parents outside the room at the beginning of the observation to ask how long the observation will last or what they can play. A minority of the observations had to be stopped earlier because of fatigue of the children and young people with PIMD. Consequently, not all video fragments had the exact same duration. The average duration of the condition in which two peers with PIMD were observed was 21 minutes and 43 seconds (range: 11 minutes and 15 seconds to 24 minutes and 37 seconds). The average duration of the sibling observations was 20 minutes and 33 seconds (range: 9 minutes and 4 seconds to 26 minutes and 36 seconds). The observation duration was adjusted by calculating the percentage of the observation duration of every code by use of the software The Observer XT 10.1. This output was imported in the software package SPSS statistics 18 for the statistical analyses.

To get an overview of the frequency and nature of the peer directed behaviours of the children and young people with PIMD and the attention directing behaviours of the siblings, descriptive analyses were used. Using a Wilcoxon Signed Rank test the singular and multiple peer directed behaviours of the children and young people with PIMD during the peer condition and the sibling condition were compared. To get insight in how the siblings influence the occurrence of peer directed behaviours in children and young people with PIMD sequential analyses were done using the software package GSEQ (Bakeman & Quera 2011). The conditional probabilities and Yule's Q were calculated. The conditional probability indicates the likelihood the target behaviour would appear simultaneous with or subsequent on the given behaviour. Each cell of a contingency table contains the joint frequency of the target and given behaviours. By dividing the joint frequency of each cell by the sum of its row the conditional probability is calculated (Bakeman & Quira, 2011). The Yules's Q is an effect size which is a straightforward

algebraic transformation of the odds ratio. The calculation of the Yule's Q in a 2x2 contingency table is as follows:

		Target behaviour: Yes	Target behaviour: No
Given behaviour	Yes	a	b
	No	c	d

$$\text{Yule's Q} = \frac{ad - bc}{ad + bc}$$

The Yule's Q varies from -1 to +1. A Yule's Q value of zero indicates no association, +1 indicates a perfect positive association, and -1 a perfect negative association. A higher absolute value of the Yule's Q indicates a stronger association (Bakeman & Quira, 2011).

2.5. Previously used data and present analyses

Part of the data in which dyads of persons with PIMD were observed have already been used in a previous study (Nijs *et al.* 2014). In this previous study the nature and frequency of peer directed behaviours of two persons with PIMD were compared in presence or in absence of a direct support worker. 28 persons with PIMD, forming 14 dyads were observed in these two conditions. To get a better understanding of the peer directed behaviours presented by the persons with PIMD these behaviours were investigated more in depth in the condition in which they were observed in absence of a direct support worker. We found (1) that they present significantly more singular peer directed behaviours compared to multiple peer directed behaviours, (2) that more multiple peer directed behaviours could be observed in the ten seconds following on the singular peer directed behaviours, and (3) that no mutual interactions between persons with PIMD could be observed. Of these 28 persons with PIMD participating in the previous study, 13 were also observed together with their sibling. The data of these 13 persons with PIMD in the condition with a peer with PIMD, also used in the previous described

study (Nijs *et al.* 2014), and in the condition with the sibling were used in the present study. In the present study we investigated in depth the difference in amount and nature of the presented peer directed behaviours during interactions with siblings and with peers with PIMD.

3. Results

3.1. Peer directed behaviour of the children and young people with PIMD

Low rates of peer/sibling directed behaviours were found in both conditions, with frequencies of multiple peer directed behaviour particularly low. Peer directed behaviours of the children and young people with PIMD were far more frequently seen during the sibling condition than with a peer with PIMD (table 4).

Singular peer directed behaviours were significantly more frequently observed in the sibling condition (30.76%) compared to the condition with a peer with PIMD (13.73%). This difference is significant (z = -2.345, p <.05, r = -0.46). The most striking difference in the categories of singular peer directed behaviours pertained to object related behaviours, which increased from zero in the peer condition to 13.15% of the time in the sibling condition. Also facial expressions, vocalisations and moving towards the peer were presented more in the sibling condition.

Multiple peer directed behaviours occurred very rarely; 3.20% of the observation time in the peer condition and 2.43% in the sibling condition. However, this difference is not significant (z = -0.245, p = 0.807, r = -0.05).

3.2. Behaviour of the siblings

In 66.30% of the time the siblings showed attention directing behaviours towards their sibling with PIMD. In 40.24% of the time only nonverbal behaviour was presented, in 12.79% of the time only verbal behaviour, and in 13.27% of the time a combination of verbal and nonverbal attention directing behaviour (table 5).

The siblings engaged in nonverbal attention directing behaviour 53.51% of the time. This was either alone or in combination with verbal attention directing behaviours. Most commonly pointing or showing an object, making noises and physical support were observed. Looking at the minimum and maximum amount of time the codes were allocated, it seems that there was a lot of variation between the siblings. In 26.06% of the time verbal attention directing behaviour was observed. Mostly comments and vocalisations were given by the sibling. Also in the verbal attention directing behaviour a great variety of behaviours was observed. The siblings presented significantly more nonverbal attention directing behaviour compared to verbal attention directing behaviour (z= -2.201, p <.05, r = -0.43).

3.3. Relationship between the behaviour of the sibling and the behaviour of the person with PIMD

To investigate which attention directing behaviours of the siblings were effective in eliciting peer directed behaviours in the children and young people with PIMD sequential relationships were calculated. For the verbal attention directing behaviours, the nonverbal attention directing behaviours, the combination of the verbal and nonverbal attention directing behaviours, and all attention directing behaviours, we investigated if the children and young people with PIMD presented multiple or singular peer directed behaviour during or 10 seconds after the sibling's behaviour (table 6). A moderate sequential relationship was found between the combined nonverbal and verbal attention directing behaviours of the siblings and the multiple peer directed behaviours of the children and young people with PIMD during this attention directing behaviour (Yule's Q = .51). There was a weak association between the multiple peer directed behaviours of the children and young people with PIMD during the nonverbal as well as the verbal attention directing behaviours of the siblings (Yule's Q = .30 and .31). Finally, a weak

sequential relationship was observed between all attention directing behaviours of the sibling and the singular peer directed behaviours of the child with PIMD (Yule's Q = .35).

4. Discussion

The first aim of this study was to compare the peer directed behaviours of the children and young people with PIMD in interactions with a sibling and in interactions with a peer with PIMD. As expected, more peer directed behaviours were observed when children and young people with PIMD interact with their sibling. Significantly more singular peer directed behaviours were observed in the sibling condition. For the multiple peer directed behaviours no significant difference was found. We were expecting to observe more multiple peer directed behaviours too during the sibling condition, because the sibling can support the child with PIMD to present these more complex peer directed behaviours. In previous studies we found that the support of the direct support worker also did not increase the multiple peer directed behaviours of the children and young people with PIMD (Nijs *et al.* in press). It may be that these behaviours are too difficult for children and young people with PIMD due to their profound and multiple disabilities.

The second aim of this study was to investigate the behaviour of the siblings in depth. The siblings mainly used nonverbal attention directing behaviours. Siblings often used physical support such as helping the child with PIMD to grasp an object by manipulating the child's hand. This is in contrast to direct support workers who have been found to use communicative acts and less nonverbal behaviours (Bradshaw 2001; Hostyn *et al.* 2011). The siblings also presented verbal attention directing behaviours such as simple comments and vocalisations. On the contrary direct support workers were reportedly more likely to use complex language which cannot be understood by the children and young people with PIMD (Bradshaw 2001).

The third aim of this study was to get insight in the effectiveness of attention directing behaviours of the siblings in eliciting peer directed behaviours in the children and young people with PIMD. Although multiple peer directed behaviours were shown infrequently by the children and young people with PIMD, they do seem to have been elicited by siblings' attention directing behaviours, although this effect was not maintained beyond the immediate moment. In a previous study on peer directed behaviours in persons with PIMD (Nijs et al., 2014), we concluded that presenting multiple peer directed behaviours may be too difficult for children and young people with PIMD. Based on this result, we must conclude that eliciting multiple peer directed behaviours is possible. In particular the combination of nonverbal and verbal attention directing behaviours seemed to be effective in eliciting multiple peer directed behaviour in children and young people with PIMD.

Some limitations with regard to this study can be formulated. First, we tried to capture all behaviours of the siblings in a standardized scheme. However, every sibling interaction is unique. They all have their own routines and games which reflect familiar behaviour sequences that are well rehearsed within the family. It was impossible for us to capture the unique nature of each sibling interaction in our coding scheme. To get a better idea on these routines parents need to be asked for more information or longer periods of typical day activities need to be observed. Additionally, siblings often present lots of behaviours at a time which made it complex to capture all their behaviours. Second, we encountered difficulties in coding the tactile code 'touching'. It was hard to see when the sibling touched the child with PIMD or when the child with PIMD touched the sibling. Probably we missed some touching behaviours of the children and young people with PIMD. Third, for persons with additional visual disabilities it was not easy to code their orientation towards the peer. Direct support workers did not have detailed information on the nature of the visual disabilities. The visual impairments have undoubtably an influence on the nature of peer directed behaviours. In the definition of

multiple peer directed behaviour eye contact plays a central role. Therefore, in this study we have defined peer directed behaviour in a broader way, including singular and multiple peer directed behaviours and including different modalities. Including the singular peer directed behaviours made the visual directedness on the peer unnecessary to code a behaviour as peer directed. Based on the communication profiles of the persons with PIMD we could get insight in how they presented their directedness on others. Future research is necessary to clarify the specific influence of the sensory and motor disabilities of the child on the specific nature of their peer directed behaviours.

Various possibilities for future research can be formulated. First, we can conclude that interacting with siblings seems to be motivating and encouraging for children and young people with PIMD to present peer directed behaviours. It is hard to capture what it is in particular that attracts the attention of the child with PIMD, although the results of our study point to the positive effect of combined verbal and nonverbal attention directing behaviour. These results can help direct support workers in promoting peer directed behaviours in children and young people with PIMD and in directing the attention of the person with PIMD. It would be interesting to compare the attention directing behaviours of siblings and direct support workers. In our study siblings often used physical strategies. It can be asked if direct support workers are also able to use these strategies and if these are effective. Second, various personal characteristics of the sibling may have influenced the amount and nature of their attention directing behaviours and consequently the amount and nature of the peer directed behaviours presented by the children and young people with PIMD. Due to the small participant group doing reliable analyses on these influences was not possible in this study. By observing an increased amount of sibling dyads and composing the participant group in a way that age-groups or gender groups can be differentiated, will provide opportunities for investigating the effects of these personal characteristics. At last future research must focus on how peer directed

behaviours in children and young people with PIMD can be encouraged. A sibling, a typically developing peer or a direct support worker might be a facilitator for peer interactions. The findings of this study point in the direction that facilitators should primarily focus on singular peer directed behaviours. It can also be asked if there is a difference between interactions with a typically developing, but unfamiliar peer and those with a sibling.

This study revealed insight in how children and young people with PIMD present peer directed behaviours. Although, we thought to observe more multiple peer directed behaviours these behaviours seem to be difficult to present. Siblings however succeed in eliciting the multiple peer directed behaviours, although this is limited. For practice this delivers insight in the nature of the behaviours which are presented by children and young people with PIMD and on which behaviours must be focussed during interactions. Direct support workers can for example learn from siblings on how to direct the attention of children and young people with PIMD.

References

Anderson N. B. & Brady M. P. (1993) Improving motor-responses in students with severe disabilities using adult instruction and peer social interactions. *Education and Training in Mental Retardation and Developmental Disabilities* **28**, 47-56.

Anderson E. R., Hetherington E. M., Reiss D. & Howe G. (1994) Parents' non-shared treatment of siblings and the development of social competence during adolescence. *Journal of Family Psychology* **8**, 303-320.

Bakeman R. & Quera V. (2011) *Sequential Analysis and Observational Methods for the Behavioral Sciences*. Cambridge University Press, Cambridge.

Berk L.E. (2003). *Development Through the Lifespan* (3th edition). Allyn and Bacon, Boston.

Bradshaw J. (2001) Complexity of staff communication and reported level of understanding skills in adults with intellectual disability. *Journal of Intellectual Disability Research* **45**, 233-243.

Brady M. P., Martin S., Williams R. E. & Burta M. (1991) The effects of fifth graders' socially directed behavior on motor and social responses of children with severe multiple handicaps. *Research in Developmental Disabilities* **12**, 1-16.

Brown, W. H., Odom S. L. & Conroy M. (2001) An intervention hierarchy for promoting preschool young children's peer interactions in natural environments. *Topics in Early Childhood Special Education* **21**, 162–175.

Brownell C.A. (1990) Peer social skills in toddlers: Competencies and constraints illustrated by same-age and mixed-age interaction. *Child Development* **61**, 838-848.

Cacioppo J. T., Bernston G. G., Sheridan J. F. & McClintock M. K. (2000) Multilevel integrative analysis of human behaviour: Social neuroscience and the complementing nature of social and biological approaches. *Psychological Bulletin* **126**, 829-843.

Canevello A. & Crocker J. (2010) Creating good relationships: Responsiveness, relationships quality, and interpersonal goals. *Journal of Personality and Social Psychology* **99**, 78-106.

Caro P. & Derevensky J. L. (1997) An exploratory study using the Sibling Interaction Scale: Observing interactions between siblings with and without disabilities. *Education and Treatment of Children* **20**, 383-403.

Cohen S. (2004) Social relationships and health. *American Psychologist* **59**, 676-684.

Dallas E., Stevenson J. & McGurk H. (1993a) Cerebral-palsied children's interactions with siblings - I. Influence of severity of disability, age and birth order. *Journal of Child Psychology and Psychiatry* **34**, 621-647.

Dallas E., Stevenson J. & McGurk H. (1993b) Cerebral-palsied children's interactions with siblings - II. Interactional structure. *Journal of Child Psychology and Psychiatry* **34**, 649-671.Foreman P., Arthur-Kelly M., Pascoe S. & King B. S. (2004) Evaluating the educational experiences of students with profound and multiple disabilities in inclusive and segregated classroom settings: An Australian perspective. *Research and Practice for Persons with Severe Disabilities* **29**, 183-193.

Girolametto L., Weitzman E. & Greenberg, J. (2004) The effects of verbal support strategies on small-group peer interactions. *Language, Speech, and Hearing Services in School* **35**, 254-268.

Grove N., Bunning K., Porter J. & Olsson C. (1999) 'See what I mean': Interpreting the meaning of communication by people with severe and profound intellectual disabilities. *Journal of Applied Research in Intellectual Disabilities* **12**, 190–203.

Guralnick M.J. (1999) Family and child influences on the peer-related social competence of young children with developmental delays. *Mental Retardation and Developmental Disabilities Research Reviews* **5**, 21-29.

Hanline M. F. (1993) Inclusion of preschoolers with profound disabilities: An analysis of children's interactions. *The Association for Persons with Severe Handicaps* **18**, 28-35.

Hartup W. W. (1989) Social relationships and their developmental significance. *American Psychologist* **44**, 120-126.

Hartup W.W. & Moore S.G. (1990). Early peer relations: Developmental significance and prognostic implications. *Early Childhood Research Quarterly* **5**, 1-17.

Hartup, W. W., & Stevens, N. (1997). Friendships and adaptation in the life course. *Psychological Bulletin* **121**, 355-370.

Hostyn,I., Daelman, M., Janssen, M. J. & B. Maes. (2010). Describing dialogue between persons with profound intellectual and multiple disabilities and direct support staff using the scale for dialogical meaning making. *Journal of Intellectual Disability Research* **54**, 679–690.

Hostyn I. & Maes B. (2009) Interaction between persons with profound intellectual and multiple disabilities and their partners: A literature review. *Journal of Intellectual and Developmental Disability* **34**. 296-312.

Hostyn I., Neerinckx H. & Maes B. (2011) Attentional processes in interactions between people with profound intellectual and multiple disabilities and direct support staff. *Research in Developmental Disabilities* **32**, 491-503.

Houwen S., van der Putten A. & Vlaskamp, C. (2014) A systematic review of the effects of motor interventions to improve motor, cognitive, and/or social functioning in people with severe or profound intellectual disabilities. *Research in Developmental Disabilities* **35**, 2093-2116.

Hunt P., Alwell M., Farron-Davis F. & Goets L. (1996) Creating socially supportive environments for fully included students who experience multiple disabilities. *The Association for Persons with Severe Handicaps* **21**, 53-71.

Kamstra A., van der Putten A. A. J. & Vlaskamp C. (2014) The structure of informal social networks of persons with profound intellectual and multiple disabilities. *Journal of Applied Research in Intellectual Disabilities.* Advance online publication.

Karelina K. & De Vries A. (2011) Modelling social influences on human health. *Psychosomatic Medicine* **73**, 67-74.

Kazdin A. E. (1977) Artifact, bias, and complexity of assessment: The ABCs of reliability. *Journal of Applied Behaviour Analysis* **10**, 141-150.

Landis J. R. & Koch G. G. (1977) The measurement of observer agreement for categorical data. *Biometrics* **33**, 159–174.

Lincoln K. D. (2000) Social support, negative social interactions, and psychological well-being. *Social Service Review* **74**, 231-252.

Lobato D. J., Miller C. T., Barbour L., Hall L. J. & Pezzullo J. (1991) Preschool siblings of handicapped children: Interactions with mothers, brothers, and sisters. *Research in Developmental Disabilities* **12**, 387-399.

Logan K. R., Jacobs H. A., Gast D. L., Murray A. S., Daino K. & Skala C. (1998) The impact of typical peers on the perceived happiness of students with profound multiple disabilities. *Journal of the Association for Persons with Severe Handicaps* **23**, 309-318.

McEwen I. (1992) Assistive positioning as a control parameter of social-communicative interactions between students with profound multiple disabilities and classroom staff. *Physical Therapy* **72**, 634-644.

McHale S. M., Updegraff K. A. & Whiteman S. D. (2012) Sibling relationships and influences in childhood and adolescence. *Journal of Marriage and Family* **74**, 913-930.

Mueller E. & Brenner J. (1977) The origins of social skills and interaction among playgroup toddlers. *Child Development* **48**, 854-861.

Mueller E. & Silverman N. (1989) Peer relations in maltreated children. In: *Child Maltreatment: Theory and Research on the Causes and Consequence of Child Abuse and Neglect* (eds. D. Cicchetti & V. Carlson), pp. 529-578. Cambridge University Press, New York.

Nakken H. & Vlaskamp C. (2007) A need for a taxonomy for profound intellectual and multiple disabilities. *Journal of Policy and Practice in Intellectual Disabilities* **4**, 83-87.

Neerinckx H., Vos P., Van Den Noortgate W. & Maes B. (2014) Temporal analysis of attentional processes in spontaneous interactions between people with profound intellectual and multiple disabilities and their support workers. *Journal of Intellectual Disability Research* **58**, 721-733.

Nijs S. & Maes B. (2014) Social peer interactions in persons with profound intellectual and multiple disabilities: a literature review. *Education and Training in Autism and Developmental Disabilities* **49**, 153-165.

Nijs S., Penne A., Vlaskamp C & Maes B. (in press) Peer interactions among children with profound intellectual and multiple disabilities during group activities. Journal of Applied Research in Intellectual Disabilities .

Nijs S., Vlaskamp C & Maes B. (2014). The nature of peer directed behaviours in children with profound intellectual and multiple disabilities and social scaffolding behaviours of the direct support worker. Manuscript submitted for publication.

Olsson C. (2004) Dyadic interaction with a child with multiple disabilities: A system theory perspective on communication. *Augmentative and Alternative Communication* **20**, 228-242.

Petry K. & Maes B. (2007) Description of the support needs of people with profound multiple disabilities using the 2002 AAMR system: An overview of literature. *Education and Training in Developmental Disabilities* **42**, 130-143.

Porter J., Ouvry C., Morgan M. & Downs C. (2001) Interpreting the communication of people with profound and multiple learning difficulties. *British Journal of Learning Disabilities* **29**, 12-16.

Rook K. S. (1984) The negative side of social interaction: Impact on psychological well-being. *Journal of Personality and Social Psychology* **46,** 1097-1108.

Selby J. M. & Bradley B. S. (2003) Infants in groups: A paradigm for the study of early social experience. *Human Development* **46**, 197-221.

Stoneman Z. (2001) Supporting positive sibling relationships during childhood. *Mental Retardation and Developmental Disabilities Research Reviews* **7**, 134-142.

Tadema A. C. & Vlaskamp C. (2004) *Inventarisatielijst kindkenmerken deel 1:Vragenlijst ten behoeve van kinderen met een ontwikkelingsperspectief tot 24 maanden en bijkomende problematiek.* Stichting Kinderstudies, Groningen.

Tadema A. C., Vlaskamp C. & Ruijssenaars A. J. J. M. (2005) The development of a checklist of child characteristics for assessment purposes. *European Journal of Special Needs Education* **20**, 403– 417.

Tadema A. C., Vlaskamp C. & Ruijssenaars A. J. J. M. (2007) The validity of support profiles for children with profound multiple learning difficulties. *European Journal of Special Needs Education* **22**, 147–160.

Umberson D. & Montez J. K. (2010) Social relationships and health: A flashpoint for health policy. *Journal of Health and Social Behaviour* **51**, 54-66.

Vandell D.L. & Wilson K.S. (1987) Infants' interactions with mother, sibling, and peer: Contrasts and relations between interaction systems. *Child Development* **58**, 176-186.

van der Putten A., Vlaskamp C., Reynders K. & Nakken H. (2005) Children with profound intellectual and multiple disabilities: the effects of functional movement activities. *Clinical Rehabilitation* **19**, 613-620.

Vlaskamp C. (2011) Kijken naar ontwikkeling. In: *Ondersteuning van Mensen met Ernstige Meervoudige Beperkingen: Handvatten voor een Kwaliteitsvol Leven* (eds B. Maes. C. Vlaskamp & A. Penne), pp. 59-73. Acco, Leuven.

Vygotsky L. S. (1978) Interaction between learning and development. In: *Mind in Society: The development of Higher Psychological Processes* (eds M. Cole, V. John-Steiner, S. Scribner & E. Souberman), pp. 29-36. Harvard University Press, Cambridge.

Williams S. T., Mastergeorge A. M. & Ontai L. L. (2010) Caregiver involvement in infant peer interactions: Scaffolding in a social context. *Early Childhood Research Quarterly* **25**, 251-266.

Wood D. J., Bruner J. S. & Ross G. (1976) The role of tutoring in problem solving. *Journal of Child Psychiatry and Psychology* **17**, 89-100.

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Conflict of Interest

We do not have any conflict of interest in publishing the results of our study.

Table 1
Participant characteristics

Child with PIMD	Peer with PIMD	Sibling
Female 10 years 11 months Developmental level: unknown Visual impairment Wheelchair user	Male 12 years 6 months Developmental level: unknown Visual impairment Wheelchair user	Male 7 years 5 months Contact with sibling: Daily At home
Male 7 years 5 months Developmental level: 7 months Visual impairment Wheelchair user	Male 10 years 1 month Developmental level: unknown Wheelchair user	Female 8 years 6 months Contact with sibling: Daily At home
Female 9 years 3 months Developmental level: 7 months Auditory impairment Wheelchair user	Female 9 years 10 months Developmental level: 6 months Auditory impairment Wheelchair user	Male 11 years 11 months Contact with sibling: Weekend At home
Male 10 years 4 months Developmental level: unknown Wheelchair user	Female 6 years 6 months Developmental level: unknown Blind Wheelchair user	Male 10 years 4 months Contact with sibling: Weekend and Wednesday At home and at facility
Female 11 years 2 months Developmental level: unknown Visual impairment Wheelchair user	Male 9 years 1 months Developmental level: unknown Visual impairment Wheelchair user	Male 12 years 8 months Contact with sibling: Weekend + Wednesday At home and at facility
Female 14 years 8 months Developmental level: unknown Visual and auditory impairment Wheelchair user	Female 13 years 2 months Developmental level: unknown Visual impairment Wheelchair user	Female 11 years 5 months Contact with sibling: Daily At home
Female 6 years 11 months Developmental level: unknown Wheelchair user	Male 12 years 7 months Developmental level: unknown Wheelchair user	Female 7 years 2 months Contact with sibling: Weekend At home and at facility
Female 17 years 8 months Developmental level: unknown Wheelchair user	Male 17 years 2 months Developmental level: unknown Wheelchair user	Male 11 years 9 months Contact with sibling: Weekend At home

Table 1 (continued)
Participants characteristics

Child with PIMD	Peer with PIMD	Sibling
Female 18 years 1 month Developmental level: 12 months Wheelchair user	Female 18 years 1 month Developmental level: 12 months Wheelchair user	Female 12 years 7 months Contact with sibling: Weekend At home and at Facility
Male 9 years 4 months Developmental level: 2 months Wheelchair user	Male 9 years 4 months Developmental level: 2 months Wheelchair user	Male 12 years 3 months Contact with sibling: Weekend At home
Female 9 years 6 months Developmental level: 8-9 months Wheelchair user	Male 7 years 7 months Developmental level: 4-5 months Wheelchair user	Female 10 years 11 months Contact with sibling: Weekend At home
Male 12 years 3 months Developmental level: 24 months Wheelchair user	Female 15 years 1 months Developmental level: 3-6 months Visual impairment Wheelchair user	Male 12 years 3 months Contact with sibling: Daily At home
Male 13 years 11 months Developmental level: 10 months Wheelchair user	Male 12 years 0 months Developmental level: unknown Wheelchair user	Male 9 years 8 months Contact with sibling: Daily At home

Table 2

Coding scheme for behaviour of children and young people *with PIMD*

Child behaviour	Examples
Other behaviour	
Directed at the environment	Looking around
Directed towards the support worker	Looking towards the support worker
Directed at interaction support worker and peer	Looking at the one-on-one interaction
Not alert or sleepy	Looking to themselves, closing the eyes
Insufficient clarity of the video recording	Someone else is in front of the camera
Peer directed multiple behaviour	Looking at or turning head or body in the direction of the peer in combination with:
Vocalisations	Screaming
Noises	Tapping on the table
Moving	Moving in the direction of the peer
Gestures	Waving
Facial expression	Smiling
Object related	Looking at the object of the peer
Touching	Touching the peer or their wheelchair
Combination	Combination of two or more behaviours
Peer directed singular behaviour	
Looking at the peer	Looking at the peer
Vocalisations	Laughing out loud
Noises	Pounding with feet
Moving	Moving in the direction of the peer
Gestures	Pointing
Facial expression	Looking angry,..
Object related	Offering
Touching	Touching the peer or their wheelchair

Table 3
Coding scheme for the attention directing behaviour of the sibling

Sibling's behaviour	Examples
Nonverbal attention directing behaviour	
(Alternating) eye contact	Trying to make eye contact
Directing the attention towards an object	Pointing, showing an object
Directing the attention towards themselves	Jumping in front of the child, dancing,…
Noises	Tabbing on the table
Tactile	Hugging, touching the child
Tactile with an object	Pushing with an object on the hands
Physical support	Taking the hand to touch a toy
Active play behaviour	Throwing a ball to the peer
Other nonverbal attention directing behaviour	
Combination	
Verbal attention directing behaviour	
Attention	Calling the name
Command	"Give me the ball", "Don't do that"
Comment	Talking about an object
Question	"What are you doing?"
Vocalisation	Making noises
Singing or reading	Singing a song or reading in a book
Other verbal attention directing behaviour	
Combination	
Other behaviour	

Table 4

Behaviour of the children and young people *with PIMD in a condition with a peer with PIMD or with a sibling and comparison between the two conditions (% of the time observed)*

	Peer condition		Sibling condition		Comparison
	Mean (%)	SD (%)	Mean (%)	SD (%)	(%)
Peer directed singular behaviour	**13.73**	**10.53**	**30.76**	**14.68**	**17.03**
Vocalisations	1.41	4.94	4.82	10.24	3.41
Noises	0.19	0.50	0.07	0.18	-0.12
Moving	0.01	0.03	0.17	0.37	0.16
Facial expression	0.24	0.38	2.58	3.95	2.34
Looking at the peer	7.54	6.26	8.51	6.68	0.97
Object related	0.00	0.00	13.15	9.93	13.15
Touching	4.36	7.08	1.46	1.87	-2.9
Gestures	0.01	0.05	0.00	0.00	-0.01
Peer directed multiple behaviour	**3.20**	**4.85**	**2.43**	**2.72**	**-0.77**
Vocalisations	0.90	2.80	0.80	1.06	-0.1
Noises	0.13	0.47	0.00	0.00	-0.13
Moving	0.11	0.40	0.10	0.19	-0.01
Facial expression	0.23	0.67	0.68	1.04	0.45
Object related	0.00	0.00	0.31	0.47	0.31
Touching	1.67	3.81	0.40	0.69	-1.27
Combination	0.13	0.20	0.43	0.70	0.30
Other behaviour	**83.07**	**13.86**	**66.52**	**15.44**	**-16.55**
Not alert or sleepy	24.62	34.56	3.97	8.41	-20.65
Insufficient clarity of the video recording	1.25	4.50	2.67	3.01	1.42
Directed on the environment	57.20	33.74	59.88	20.68	2.68

Table 5
Attention directing behaviours of the sibling

	Mean (%)	SD (%)	Minimum (%)	Maximum (%)
Non-verbal attention directing behaviour	**53.51**	**21.98**	**4.64**	**77.51**
(Alternating) eye contact	1.48	3.22	0.00	11.80
Pointing or showing an object	10.01	8.66	0.86	27.10
Making noises	12.22	14.24	0.06	45.40
Touching	8.72	11.53	0.12	44.03
Touching with an object	2.77	3.94	0.00	10.18
Physical support	12.48	20.93	0.10	73.42
Active play behaviour	2.11	3.58	0.00	9.56
Directing the attention towards themselves	2.86	4.46	0.00	16.03
Combination	0.35	0.60	0.00	1.91
Verbal attention directing behaviour	**26.06**	**23.78**	**5.95**	**91.16**
Attention	2.54	3.67	0.00	12.89
Command	2.77	2.73	0.53	10.02
Comment	9.23	19.74	0.00	73.80
Support	0.86	1.03	0.00	2.98
Question	2.15	2.34	0.00	6.46
Vocalisation	5.42	6.00	0.00	22.39
Singing/reading	3.08	5.94	0.00	17.47
Other	0.02	0.05	0.00	0.20

Table 6
Sequential relationship between behaviour of the child with PIMD and the sibling

	Multiple peer directed behaviour		Singular peer directed behaviour	
	Conditional probability	Yule's Q	Conditional probability	Yule's Q
During nonverbal attention directing behaviour	.03	.30*	.34	.23
10 seconds after nonverbal attention directing behaviour	.02	.00	.30	.08
During verbal attention directing behaviour	.03	.31*	.35	.19
10 seconds after verbal attention directing behaviour	.02	.07	.28	-.04
During combination verbal and nonverbal attention directing behaviour	.04	.51**	.33	.11
10 seconds after combination verbal and nonverbal attention directing behaviour	.02	.11	.31	.08
During attention directing behaviour	0.02	0.21	0.35	0.35*
10 seconds after attention directing behaviour	0.02	-0.02	0.29	-0.01

* weak association
** moderate association